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Observation of the Transit of Venus, 1882, *December* 6. By W. E. Cooper.

I had a very good observation of the transit of *Venus* of December 6 with my 9-in. silver-on-glass Reflector by Calver; power used about 150. The definition was good, the rice grains being *very* distinctly visible a short time before the transit.

	°	′	″
Latitude N.	52	14	+
Longitude W.	2	12	45

Clock 11ˢ fast.

Owing to clouds the first contact not seen.

	h m s	Corrected Time = −11ˢ. h m s
Dark limb of *Venus* first seen	2 2 45	2 2 34
Not half on limb of Sun	2 10 30	—
Half on limb of Sun	2 11 30	2 11 19
More than half	2 11 46	—
Venus wholly visible	2 14 30	2 14 19
Internal contact not taken place	2 20 0	—
The last appearance of any well marked discontinuity in the illumination in the limb of the Sun near point of contact	2 21 55	2 21 44
Internal contact over	2 22 4	—

The Mount, Worcester:
1882, *Dec.* 7.

Ephemeris of the Satellites of Uranus, 1883. By A. Marth.

The major and minor semiaxes *a* and *b* of the apparent ellipses described by the satellites, the angle of position P of the minor axes in the direction of superior conjunction, and the latitude of the Earth above the assumed plane of the orbits, are the following:—

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Greenwich Noon.	*Ariel.*		*Umbriel.*		*Titania.*		*Oberon.*			
	a_1	b_1	a_2	b_2	a_3	b_3	a_4	b_4	P.	Lat. of Earth.
1883.	″	″	″	″	″	″	″	″	°	″
Jan. 9	14·83	+1·91	29·65	+2·66	33·88	+4·37	45·31	+5·84	285·52	+7·40
19	14·95	1·89	20·83	2·63	34·16	4·32	45·68	5·77	·51	7·26
29	15·06	1·84	20·98	2·56	34·42	4·21	46·02	5·63	·51	7·02
Feb. 8	15·15	1·77	21·11	2·47	34·63	4·05	46·31	5·42	·49	6·72
18	15·23	1·68	21·21	2·35	34·79	3·85	46·53	5·15	·48	6·35
28	15·27	1·58	21·28	2·20	34·90	3·62	46·67	4·84	·46	5·95
Mar. 10	15·29	1·47	21·31	2·05	34·95	3·36	46·73	4·50	·44	5·52
20	15·29	1·36	21·30	1·89	34·93	3·10	46·71	4·15	285·41	5·09
30	15·25	1·24	21·25	1·73	34·85	2·84	46·61	3·80	·39	4·68
Apr. 9	15·20	1·14	21·17	1·58	34·72	2·60	46·43	3·48	·36	4·29
19	15·11	1·04	21·06	1·45	34·54	2·38	46·19	3·19	·34	3·96
29	15·02	0·97	20·92	1·35	34·31	2·21	45·88	2·95	·32	3·69
May 9	14·90	0·91	20·76	1·27	34·05	2·08	45·53	2·78	·31	3·49
19	14·78	0·87	20·58	1·21	33·76	1·99	45·15	2·66	·30	3·38
29	14·65	+0·86	20·40	+1·19	33·46	+1·96	44·75	+2·62	285·29	+3·35

Longitudes $u - \mathrm{U}$ of the satellites in their orbits reckoned from the points where they are at superior conjunction, and longitudes U ± 180° of the Earth, reckoned from the ascending node of the plane of the orbits on the plane of the equator:—

Greenwich Noon.	*Ariel.*		*Umbriel.*		*Titania.*		*Oberon.*		
	$u_1 - \mathrm{U}$	Diff.	$u_2 - \mathrm{U}$	Diff.	$u_3 - \mathrm{U}$	Diff.	$u_4 - \mathrm{U}$	Diff.	U.
1883.	°	1428°	°	868°	°	413°	°	267°	°
Jan. 9	249·34	·45	4·10	·74	52·84	·52	180·47	·39	5·52
19	237·79	·42	152·84	·72	106·36	·50	87·87	·38	5·55
29	226·21	·40	301·56	·69	159·86	·49	355·24	·36	5·59
Feb. 8	214·61	·37	90·25	·68	213·35	·48	262·60	·36	5·63
18	202·98	·34	238·93	·65	266·83	·47	169·96	·34	5·69
28	191·32	·31	27·58	·64	320·30	·46	77·30	·34	5·74
Mar. 10	179·63	·29	176·22	·63	13·76	·45	344·64	·33	5·80
20	167·92	·27	324·85	·61	67·21	·45	251·97	·33	5·86
30	156·19	·25	113·46	·61	120·66	·45	159·30	·34	5·92
Apr. 9	144·44	·24	262·07	·60	174·11	·45	66·64	·34	5·97
19	132·68	·23	50·67	·60	227·56	·45	333·98	·34	6·01
29	120·91	·22	199·27	·60	281·01	·46	241·32	·36	6·04
May 9	109·13	·22	347·87	·60	334·47	·47	148·68	·36	6·06
19	97·35	·23	136·47	·61	27·94	·48	56·04	·37	6·07
29	85·58		285·08		81·42		323·41		6·06

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These values are to be interpolated for the times for which the positions of the satellites are required. The position-angles p and distances s from the centre of the planet are then found by means of the formulæ:—

$$s \sin(p - \mathrm{P}) = a \sin(u - \mathrm{U}),$$

$$s \cos(p - \mathrm{P}) = b \cos(u - \mathrm{U}).$$

The satellites move in the direction of increasing position-angles, and will be at their greatest elongations ("N" in position P + 90°, and "S" in position P − 90°), and at their superior (in position P) and inferior (in position P − 180°) conjunctions with the planet at or about the following hours, Greenwich Mean Time:—

Ariel.

	N.	S.			N.	S.			N.	S.	
1883.	h	d	h		h	d	h		h	d	h
Jan. 7	21·2	9	3·5	Feb. 24	18·5	26	0·7	Apr. 13	15·8	14	22·1
10	9·7	11	16·0	27	7·0	28	13·2	16	4·3	17	10·6
12	22·2	14	4·4	Mar. 1	19·5	3	1·7	18	16·8	19	23·1
15	10·7	16	16·9	4	8·0	5	14·2	21	5·3	22	11·6
17	23·2	19	5·4	6	20·4	8	2·7	23	17·8	25	0·1
20	11·7	21	17·9	9	8·9	10	15·2	26	6·3	27	12·6
23	0·1	24	6·4	11	21·4	13	3·7	28	18·8	30	1·1
25	12·6	26	18·9	14	9·9	15	16·2	May 1	7·3	2	13·5
28	1·1	29	7·4	16	22·4	18	4·7	3	19·8	5	2·0
30	13·6	31	19·8	19	10·9	20	17·2	6	8·3	7	14·5
Feb. 2	2·1	3	8·3	21	23·4	23	5·6	8	20·8	10	3·0
4	14·6	5	20·8	24	11·9	25	18·1	11	9·3	12	15·5
7	3·1	8	9·3	27	0·4	28	6·6	13	21·8	15	4·0
9	15·6	10	21·8	29	12·9	30	19·1	16	10·3	17	16·5
12	4·0	13	10·3	Apr. 1	1·4	2	7·6	18	22·8	20	5·0
14	16·5	15	22·8	3	13·9	4	20·1	21	11·3	22	17·5
17	5·0	18	11·3	6	2·4	7	8·6	23	23·8	25	6·0
19	17·5	20	23·7	8	14·9	9	21·1	26	12·2	27	18·5
22	6·0	23	12·2	11	3·3	12	9·6	29	0·7	30	7·0

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Umbriel.

		N.	S.				N.	S.				N.	S.	
1883.		h	d	h			h	d	h			h	d	h
Jan.	9	23·7	12	1·5	Feb.	24	13·8	26	15·5	Apr.	11	3·9	13	5·7
	14	3·2	16	4·9		28	17·2	—			15	7·4	17	9·1
	18	6·6	20	8·4	Mar.		—	2	19·0		19	10·9	21	12·6
	22	10·1	24	11·8		4	20·7	6	22·4		23	14·3	25	16·1
	26	13·5	28	15·3		9	0·2	11	1·9		27	17·8	29	19·5
	30	17·0	—			13	3·6	15	5·4	May	1	21·3	3	23·0
Feb.		—	1	18·7		17	7·1	19	8·8		6	0·7	8	2·5
	3	20·5	5	22·2		21	10·6	23	12·3		10	4·2	12	5·9
	7	23·9	10	1·7		25	14·0	27	15·8		14	7·7	16	9·4
	12	3·4	14	5·1		29	17·5	31	19·2		18	11·2	20	12·9
	16	6·9	18	8·6	Apr.	2	21·0	4	22·7		22	14·6	24	16·4
	20	10·3	22	12·0		7	0·5	9	2·2		26	18·1	28	19·8

Titania.

N. elong.			Inf. Conj.			S. elong.			Sup. Conj.		
1883.		h			h			h			h
Jan.	9	21·6	Jan.	12	1·8	Jan.	14	6·0	Jan.	16	10·3
	18	14·5		20	18·7		22	23·0		25	3·3
	27	7·4		29	11·7		31	15·9	Feb.	2	20·2
Feb.	5	0·4	Feb.	7	4·6	Feb.	9	8·9		11	13·1
	13	17·4		15	21·6		18	1·8		20	6·1
	20	10·3		24	14·6		26	18·8		28	23·0
Mar.	3	3·3	Mar.	5	7·5	Mar.	7	11·8	Mar.	9	16·0
	11	20·3		14	0·5		16	4·7		18	9·0
	20	13·2		22	17·5		24	21·7		27	2·0
	29	6·2		31	10·4	Apr.	2	14·7	Apr.	4	18·9
Apr.	6	23·2	Apr.	9	3·4		11	7·7		13	11·9
	15	16·1		17	20·4		20	0·6		22	4·9
	24	9·2		26	13·4		28	17·6		30	21·8
May	3	2·1	May	5	6·3	May	7	10·6	May	9	14·8
	11	19·1		13	23·3		16	3·5		8	7·8
	20	12·0		22	16·3		24	20·5		27	0·7
	29	5·0									

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Oberon.

N. elong.		Inf. Conj.		S. elong.		Sup. Conj.	
1883.	h		h		h		h
	—	Jan. 8	23·6	Jan. 12	8·4	Jan. 15	17·1
Jan. 19	1·9	22	10·7	25	19·5	29	4·3
Feb. 1	13·1	Feb. 4	21·8	Feb. 8	6·6	Feb 11	15·4
15	0·2	18	9·0	21	17·8	25	2·6
28	11·4	Mar. 3	20·2	Mar 7	5·0	Mar. 10	13·8
Mar. 13	22·6	17	7·4	20	16·2	24	1·0
27	7·8	30	18·6	Apr. 3	3·4	Apr. 6	12·2
Apr. 9	21·0	Apr. 13	5·8	16	14·6	19	23·4
23	8·2	26	16·9	30	1·7	May 3	10·5
May 6	19·3	May 10	4·1	May 13	12·9	16	21·7
20	6·5	23	15·3	27	0·1	30	8·8